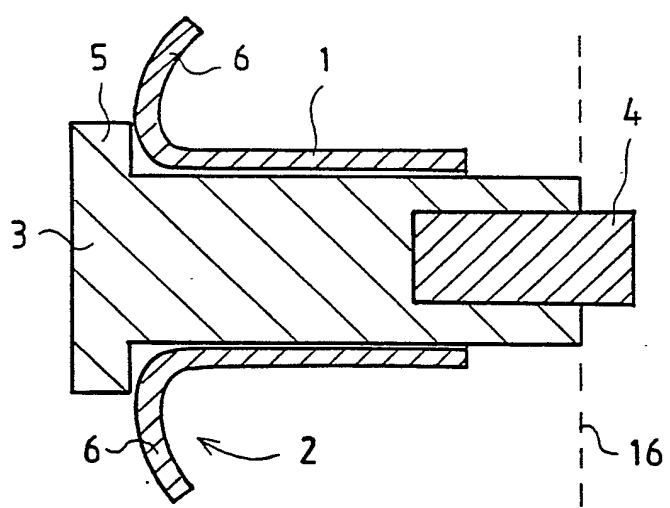


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : B60C 11/16	A1	(11) International Publication Number: WO 91/00185 (43) International Publication Date: 10 January 1991 (10.01.91)
(21) International Application Number: PCT/FI89/00129 (22) International Filing Date: 4 July 1989 (04.07.89) (71)(72) Applicants and Inventors: NURMI, Erkki [FI/FI]; Pietaririnne 9, SF-01800 Klaukkala (FI). SAARINEN, Raimo [FI/FI]; Sotkatie 9 B 6, SF-00200 Helsinki (FI). (74) Agent: PAPULA REIN LAHTELA OY; Box 981, Kansakoulukatu 5 A, SF-00101 Helsinki (FI). (81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE*, DE (European patent)*, DK, FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.		Published <i>With international search report.</i> <i>In English translation (filed in Finnish).</i>
(54) Title: SLEEVED STUD STRUCTURE <div style="text-align: center;">  </div>		
(57) Abstract <p>The invention relates to a sleeved stud structure mainly designed for the studding of vehicle tyres. The structure comprises a sleeve (1) and its holding means (2), said sleeve being embedded in the tyre, and inside the sleeve a frame (3) provided with a piece (4) of hard metal at the end extending to the tyre surface and with a flange (5) of a width exceeding the frame width at the inner end of the frame to prevent the frame from coming out through the sleeve. According to the invention, the holding means (2) consist of holding lugs (6) produced by bending the sleeve (1) end inside the tyre with the aid of the flange (5) of the frame (3).</p>		

DESIGNATIONS OF "DE"

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SLEEVED STUD STRUCTURE

The present invention relates to a sleeved stud structure as defined in the introductory part of
5 claim 1.

Among the various currently known stud structures used in automobile tyres, the so-called sleeved stud has proved to be the best. As compared to other stud structures, the sleeved stud has the advantages of
10 a low road wearing effect, good gripping characteristics, high durability and good preservation of working order, noiselessness in traffic and a pleasant feel for the driver. However, not all of the disadvantages of older stud structures have been eliminated by the use
15 of sleeved studs. For instance, as compared to previously known studs, sleeved studs show no essential improvement regarding their retention in the tyre. In addition, they are relatively difficult to fit in the tyre, and the fitting always requires special and expensive
20 machines developed for the purpose. Moreover, the tyre is subjected to a relatively hard strain during the fitting of the studs as the stud holes must be stretched to allow the studs to be inserted. Furthermore, the existing stud structures provide only limited
25 possibilities for fitting additional studs in used winter tyres after the old studs have come off, because the studs always require an unused tyre area and cannot be fitted in an old hole from which the stud has come off.

30 The object of the invention is to eliminate the drawbacks mentioned above. A specific object of the invention is to produce a new type of sleeved stud structure which enables a tyre to be studded in a simple and quick manner without using special tools and ensures
35 that the stud will remain in position in the tyre throughout the useful life of the stud or the tyre.

As for the features characteristic of the

invention, reference is made to the claims. The sleeved stud structure comprises a sleeve provided with holding means, said sleeve being embedded in the tyre, and a frame fitted inside the sleeve, with a piece of wear-resistant hard metal fitted inside the outer end of the frame, and with a flange wider than the frame diameter provided at the opposite or inner end of the frame, i.e. at the end pointing to the centre of the tyre, so as to prevent the frame from moving out through the sleeve and coming off from the tyre after the stud has been fitted. According to the invention, the holding means comprised in the sleeve consist of holding lugs produced by bending the sleeve end inside the tyre with the aid of the flange of the frame, which lugs extend, relative to the axis of the stud structure, essentially perpendicularly away from the stud and essentially evenly and symmetrically on different sides of the stud, said shoulders preferably having a curved shape.

According to the invention, that end of the frame which houses the piece of hard metal is provided with an extension with a zone of reduced strength. When a pull is applied to this extension, the flange is pressed against the sleeve end, forcing the latter to bend into holding lugs extending away from the stud into the tyre material. A suitable zone of reduced strength, e.g. a groove, cut-out or a sufficient scratch is provided on the frame and/or its extension, e.g. at the juncture between them, so that when a vigorous pull is exerted on the extension, the latter will always break off from the rest of the stud structure along this zone of reduced strength.

In a preferred embodiment of the invention, the extension consists of a tension rod of a thickness essentially equal to that of the frame and made of a suitable metal, e.g. the same material as the frame, in which embodiment the piece of hard metal is located inside the elongated body formed by the frame and the

tension rod, and the zone of reduced strength is located on the surface of this body in the region of the hard metal piece, so that when a pull is exerted on the extension, the body will be severed in such a way that
5 part of the hard metal piece remains inside the frame and part of it becomes visible.

In another embodiment of the invention, the extension consists of a tension wire attached either to the frame or, passed through a hole provided in it,
10 essentially to the flange region. In this case, the tension wire is preferably provided with a zone of reduced strength suitably located inside the stud structure, either in the region of the frame or of the hard metal piece, so that when a pull is exerted on the wire
15 and it breaks off, the part remaining in the stud structure will not be visible.

The sleeved stud structure of the invention can be used like a traditional sleeved stud and the frame and/or sleeve can be coated with suitable materials, e.g. teflon, to make these parts more slidable
20 relative to each other. On the other hand, the stud structure may be provided with suitable means for interlocking the sleeve and frame to render them essentially immovable relative to each other, so that the stud will
25 function like conventional solid stud structures.

The sleeve used in the sleeved stud structure of the invention is a short piece of tube whose inner end, i.e. the end at which the holding lugs are formed when the stud is fitted in a tyre, is preferably provided with reduced-strength control tracks, e.g. suitable grooves. There may be one or more such grooves,
30 preferably four grooves arranged at even distances of 90°. These grooves control the splitting of the sleeve against the flange so that the holding means formed
35 will be even-shaped lugs that hold the sleeve essentially straight in the tyre. However, in a preferable embodiment of the invention, the grooves are arranged

unevenly on the sleeve edge in such manner that e.g. the lugs in one of the two pairs of opposite lugs (in the case of four grooves) are of equal width while the shoulders of the other pair are of a different width.

- 5 The sleeve and the whole stud structure can be fitted in a desired oblique position relative to the tyre surface. This has been found to bring certain advantages regarding the grip of the tyre.

- As compared to previously known techniques,
10 the invention has the advantage that the stud can be easily fitted without special professional skill at exactly the right depth in the tyre, using cheap tools known in themselves. Moreover, the structure practically never comes off the tyre. In practical tests, after
15 a mileage of about 20 000 km a conventional stud was detached from the tyre when a tension of 11 kg was applied to it, whereas a force about 3 - 4 times greater was required to detach a stud constructed as provided by the invention. Therefore, the stud of the invention
20 can be successfully used for complementary studding of tyres provided with conventional studs by fitting new studs in the vacant holes. Especially usable for this application is the embodiment of the invention in which the frame and the sleeve are essentially immovable
25 relative to each other.

- As compared to previously known sleeved studs, in which dirt can get into the space between the cone at the lower end of the sleeve and the flange of the frame, thus hindering the outward motion of the frame,
30 the separate and curved lugs of the sleeve form a larger space for the accumulating dirt, so that the motion of the frame will not be hindered to as high a degree as in previously known sleeved studs.

- In the following, the invention is described
35 with the aid of an example in no way restricting the invention, reference being made to the appended drawing, in which

fig. 1 presents part of a stud constructed as provided by the invention,

fig. 2 presents part of another stud constructed as provided by the invention,

5 fig. 3 presents a sectional view of the stud of the invention, illustrating the fitting operation,

fig. 4 presents a stud constructed as provided by the invention, in the final form after being fitted in a tyre.

10 Fig. 1 illustrates an embodiment of the frame structure of the sleeved stud of the invention. One end of the frame 3, i.e. the end facing inward in the tyre when fitted, is provided with a flange 5 of a width exceeding the diameter of the frame, and the other end
15 of the frame is provided with a wear-resistant hard metal piece 4 partly embedded in the frame and partly protruding from it. However, the hard metal piece is not visible, because the frame 3 is provided with an elongated extension 7, a tension rod 9 of substantially
20 the same material as the frame, said extension surrounding the hard metal piece. The frame is separated from the tension rod by a zone 8 of reduced strength, a circular groove forming the weakest part of the structure, so that when a pull is exerted on the end of the
25 tension rod and the flange 5 is simultaneously pushed in the other direction, the structure will always break into two parts along this zone of reduced strength. Thus, when the stud is fitted in a tyre, this operation being described later on, the hard metal piece will
30 become visible.

Fig. 2 illustrates another embodiment of the frame structure of the sleeved stud of the invention. In this case, the frame has a corresponding flange 5 and a hard metal piece 4 partly embedded in the frame.
35 However, the frame 3 and the hard metal piece 4 are provided with a central hole 10 accommodating an elongated extension, a tension wire 11, one end of which is

anchored in the flange area so that it cannot come out through the hole 10. In addition, the tension wire is provided with a zone 8 of reduced strength located inside the frame 3 or the hard metal piece 4. When a pull is exerted on the wire as explained above, it will break at this zone.

Figures 3 and 4 show the frame structure of the sleeved stud as illustrated by fig. 1, both in a ready-to-be-fitted state and in the state after being fitted in a tyre. In the ready-to-be-fitted state, the frame 3 of the sleeved stud structure is surrounded by a tubelike sleeve 1 with its bottom end resting against the flange 5. The internal diameter of the sleeve essentially corresponds to the external diameter of the frame 3, so that these parts fit relatively tightly together. Placed at the other end of the sleeve is a sleeve-like mounting tool 13 surrounding part of the sleeve 1 and part of the frame extension 7 and provided with a ring-like shoulder 14, the end of the sleeve 1 resting against this shoulder so that the sleeve can be pressed down with the tool against the flange. The other end of the sleeve-like mounting tool 13 is provided with suitable fixtures 15 enabling the tool to be fastened to a suitable power means, e.g. a suitable clamp, with which the extension 7 can be gripped and pulled outwards relatively vigorously. The sleeve 1 is provided with suitable control tracks 12 of reduced strength, e.g. longitudinal grooves or similar cut-outs, located at the end facing the flange 5. The sleeve end resting against the flange 5 may have a slight outward curvature effected by these tracks or otherwise.

The sleeved stud structure of the invention is fitted in a tyre as follows. The structure illustrated by fig. 3, gripped with a suitable tool such as a clamp, is inserted into a stud hole in the tyre, down to the bottom of it, so that the flange 5 is pressed against the bottom of the hole. While pressing the structure

continuously against the hole bottom, a pull is exerted on the extension 7 with the clamp or equivalent, in other words, the mounting tool 13 is pushed down towards the flange 5. As a result, the bottom edge and the whole lower part of the sleeve 1 are split along the reduced-strength control tracks 12 into holding lugs 6 extending outwards from the frame 3 and penetrating into the rubber of the tyre, the number of lugs being determined by the number of control tracks 12 provided. The pull on the extension 7, i.e. the pressure on the mounting tool 13 is continued until the mounting tool meets the flange 5 (the holding lugs 6 will remain between the tool and the flange). After this, the pull on the extension 7 will cause the latter to break off from the frame 3 along the zone 8 of reduced strength between them. Thus, only the structure shown in fig. 4 is left in the tyre, the frame 3 and its flange 5 being buried in the tyre and only the end of the hard metal piece 4 extending above the tyre surface 16.

In the structure of the invention, the holding lugs 6 formed are very rigid and hold the stud securely in position in the tyre because they are parts of a round sleeve, which means that they have a curved sectional form and therefore relatively rigid. The forward edge of the flange 5 is preferably at a relatively straight angle to the frame 3, so that it will cause the holding lugs 6 formed to turn essentially perpendicularly away from the frame 3, or even somewhat backwards towards the tyre surface, in which case they will provide a still better hold. A further advantage of the sleeved stud structure of the invention is that the diameter of the mounting tool 13 need not be any larger than the diameter of the flange 5. Thus, the assembly inserted into the stud hole in the tyre is not essentially larger than the diameter of the hole, which means that it is unnecessary to stretch the edges of the hole, the fitting is easy and requires no great force, and the edges

of the hole are not damaged but instead their strength and their ability to hold the stud in position remain as good as possible.

In the above, the invention has been described
5 in detail by referring to some of its preferred embodiments. However, the applications of the invention may vary within the scope of the idea of the invention as defined in the following claims.

CLAIMS

1. Sleeved stud structure mainly designed for the studding of vehicle tyres, said structure comprising
5 a sleeve (1) and its holding means (2), said sleeve being embedded in the tyre, and inside the sleeve a frame (3) provided with a piece (4) of hard metal at the end extending to the tyre surface and with a flange (5) of a width exceeding the frame width at the inner
10 end of the frame to prevent the frame from coming out through the sleeve, said holding means (2) consisting of holding lugs (6) produced by bending the sleeve (1) end inside the tyre with the aid of the flange (5) of the frame (3), c h a r a c t e r i z e d in that the
15 frame (3) is provided with an extension (7) at the end housing the piece (4) of hard metal, said extension being provided with a zone (8) of reduced strength, the structure being so designed that when a pull is applied to the extension, the holding lugs (6) will penetrate
20 into the tyre material and the extension will be severed from the frame.

2. Structure according to claim 1, c h a r a c t e r i z e d in that the extension (7) consists of a tension rod (9) of a thickness essentially equal
25 to that of the frame (3) and preferably made of the same material, the hard metal piece (4) being located partly inside the frame and partly inside the extension.

3. Structure according to claim 1, c h a r a c t e r i z e d in that the extension (7) consists
30 of a tension wire (11) extending through a hole (10) in the hard metal piece (4) and provided with a zone (8) of reduced strength located inside the hard metal piece.

4. Structure according to any one of claims 1 - 3, c h a r a c t e r i z e d in that the edge of
35 the sleeve (1) facing the flange (5) is provided with reduced-strength control tracks (12), e.g. grooves, along which part of the sleeve will split into holding

lugs (6).

5 5. Structure according to any one of claims
1 - 4, characterized in that the sleeve
(1) and/or the frame (3) is provided with interlocking
means, grooves or equivalent, for interlocking the
sleeve and frame so as to render them essentially immov-
able relative to each other.

10 6. Structure according to any one of claims
1 - 4, characterized in that the sleeve
(1) and/or the frame (3) is provided with a friction
coating, e.g. a teflon coating, to render these parts
more slidable relative to each other.

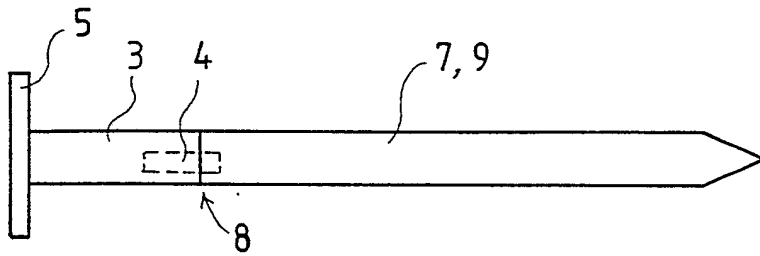


FIG. 1

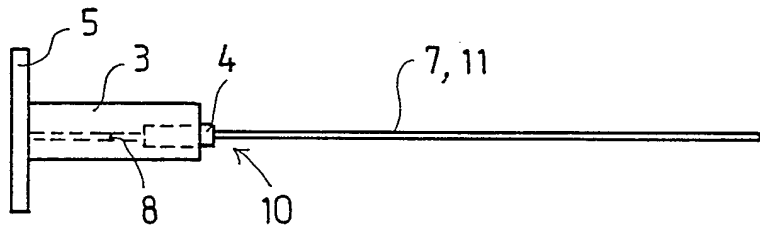


FIG. 2

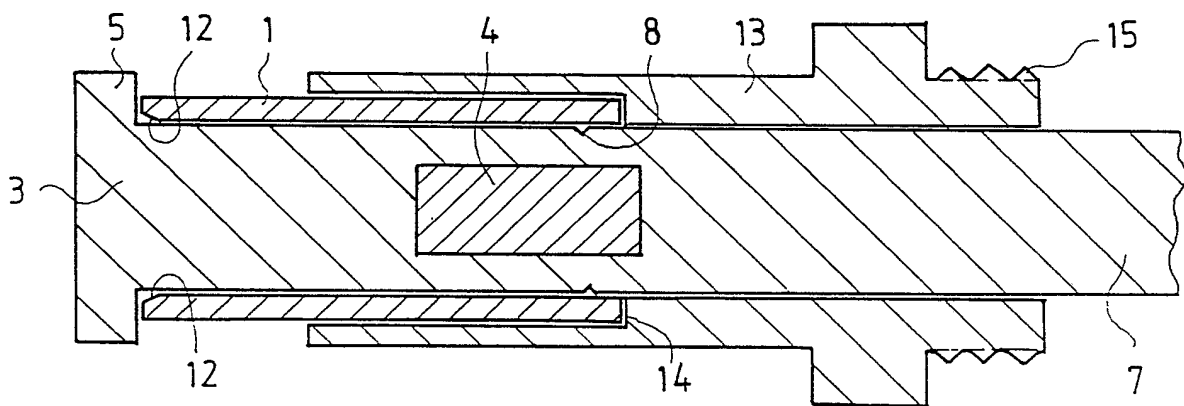


FIG. 3

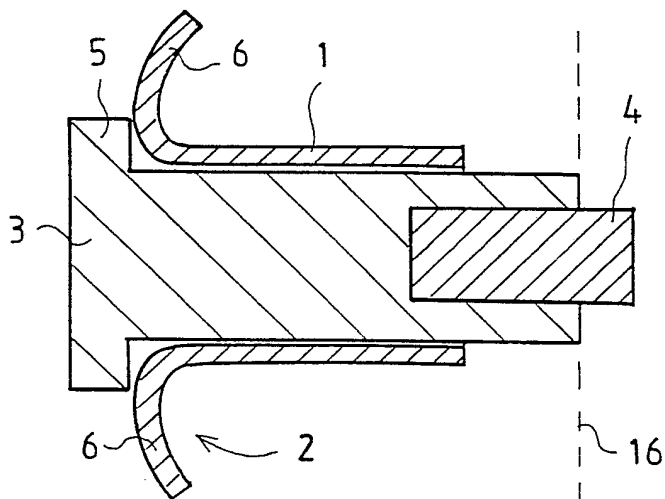


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI 89/00129

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: B 60 C 11/16		
II. FIELDS SEARCHED <div style="text-align: right; font-size: small;">Minimum Documentation Searched ⁷</div> <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;">Classification System</div> <div style="width: 70%;">Classification Symbols</div> </div> <div style="padding: 10px 0;"> IPC5 B 29 D; B 60 C </div> <div style="text-align: center; font-size: x-small; margin-top: 5px;"> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸ </div> <div style="padding: 10px 0;"> SE,DK,FI,NO classes as above </div>		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	DE, B, 1272755 (CONTINENTAL GUMMI-WERKE AKTIENGESELLSCHAFT) 11 July 1968, see the whole document --	1
Y	FI, C, 36933 (PAULI EINO EMIL SARKKINEN, ANTTI JOHANNES KÄLVIÄINEN) 31 May 1968, see the whole document --	1,2,4
Y	FI, C, 36934 (PAULI EINO EMIL SARKKINEN, ANTTI JOHANNES KÄLVIÄINEN) 31 May 1968, see the whole document -- -----	1,2,4
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>⁹ Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search 7th February 1990		Date of Mailing of this International Search Report <div style="text-align: center; font-size: large;">1990 -02- 09</div>
International Searching Authority <div style="text-align: center; font-weight: bold;">SWEDISH PATENT OFFICE</div>		Signature of Authorized Officer <div style="text-align: center;"> Göran Carlström </div>

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/FI 89/00129

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-B- 1272755	11/07/68	NONE	
FI-C- 36933	31/05/68	NONE	
FI-C- 36934	31/05/68	NONE	

DERWENT-ACC-NO: 1990-010346**DERWENT-WEEK:** 199117*COPYRIGHT 2010 DERWENT INFORMATION LTD*

TITLE: Sleeved stud for vehicle tyre comprises sleeve embedded in tyre and contg. frame with hard metal tip at outer end and flange at inner end, sleeve being bent to form lugs

PATENT-ASSIGNEE: NURMI E[NURMI]**PATENT-FAMILY:**

PUB-NO	PUB-DATE	LANGUAGE
FI 8801628 A	October 8, 1989	FI
WO 9100185 A	January 10, 1991	EN
AU 8938542 A	January 17, 1991	EN

DESIGNATED-STATES: AT AU BB BG BR CH DE DK FI GB HU JP KP
KR LK LU MC MG MW NL NO RO AT BE CH DE
FR GB IT LU NL OA SE

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
WO1991000185A	N/A	1989WO-FI00129	July 4, 1989

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	B60C11/16 20060101

ABSTRACTED-PUB-NO: FI 8801628 A**BASIC-ABSTRACT:**

The stud structure comprises a sleeve (1) and its holding means (2), said sleeve being embedded in the tyre, and inside the sleeve a frame (3) provided with a piece (4) of hard metal at the end extending to the tyre surface and with a flange (5) of a width exceeding the frame width at the inner end of the frame to prevent the frame from coming out through the sleeve. The holding means consist of holding lugs (6) produced by bending the sleeve end inside the tyre with the aid of the flange of the frame.

USE - A sleeved stud structure mainly designed for the studding of vehicle tyres. (First major country equivalent to FI8801628) (Previously notified week 9105, reissued week 9110)

CHOSEN-DRAWING: Dwg.4/4

TITLE-TERMS: SLEEVE STUD VEHICLE TYRE COMPRISE EMBED
CONTAIN FRAME HARD METAL TIP OUTER END
FLANGE INNER BEND FORM LUG

DERWENT-CLASS: Q11

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: 1991-050850